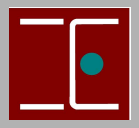

Radiographers and Radiation Protection: Education, Training and CPD

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Outline

- Introduction & Background
- Questions & Aims
- Methods
- Results & Discussion
- Conclusions

Introduction & background

- The increasing use of ionizing radiation for medical purposes emphasizes the concern about safety and justification of using ionizing radiation
- This is linked with the use of new and high-dose X-ray technology (particularly CT)
- According to the UNSCEAR 2010 Report the total number of diagnostic medical examinations (both medical and dental) is estimated to have risen from 2.4 billion (period 1991–1996) to 3.6 billion (period 1997– 2008) - a marked increase in collective doses

UNSCEAR. Sources and Effects of Ionizing Radiation. UNSCEAR 2008 [Internet]. New York: 2010. Available from: http://www.unscear.org/unscear/en/publications/2008_1.html

Introduction & background

- An appropriate use of technology aiming diagnostic or therapy and respecting the ALARA principle is a mandatory requisite to safely perform any radiological procedure

- Radiation protection is thus, a concern of all specialists in the radiology field

  - radiologists, radiographers, medical physicists, among other professional groups

Introduction & background

- The importance of education and training of these professionals in reducing patients' doses while maintaining the desired level of quality in medical exposures, as well as precise therapeutic treatments is well recognized

- ICRP. ICRP Publication 113 Education and Training in Radiological Protection for Diagnostic and Interventional Procedures [Internet]. 2009. Available from: http://www.sciencedirect.com/science/journal/01466453/39/5
- IAEA. A Syllabus for the Education and Training of RTTs [Internet]. 2005. Available from: http://www-pub.iaea.org/books/iaeabooks/7860/A-Syllabus-for-the-Education-and-Training-of-RTTs-radiation-therapists-therapy-radiographers
- ICRP. ICRP Publication 93: Managing Patient Dose in Digital Radiology [Internet]. 2004. Available from: http://www.elsevier.com/wps/find/bookdescription.cws_home/704214/description#description
- IAEA. Radiological Protection for Medical Exposure to Ionizing Radiation [Internet]. Vienna: 2002. Available from: http://www-pub.iaea.org/MTCD/publications/PDF/Pub1117_scr.pdf
- IAEA. Building Competence in Radiation Protection and the Safe Use of Radiation Sources [Internet]. Vienna: 2001. Available from: http://www-pub.iaea.org/MTCD/publications/PDF/Pub1108_scr.pdf

Introduction & background

- Education, training and continuing professional development (CPD) constitute a triad pointing towards the radiographers' development of competences in the radiation protection field

- This presentation excludes the radiographer role and competences in the fields of ultrasonography and MRI

Questions

- This presentation consists on a reflection about radiographers and radiation protection, to answer the following questions:
- What is the effective role of radiographers in healthcare?
- What are the competences hold by the radiographer in radiation protection?
- What education, training and CPD is needed to ensure a safer radiological practice?

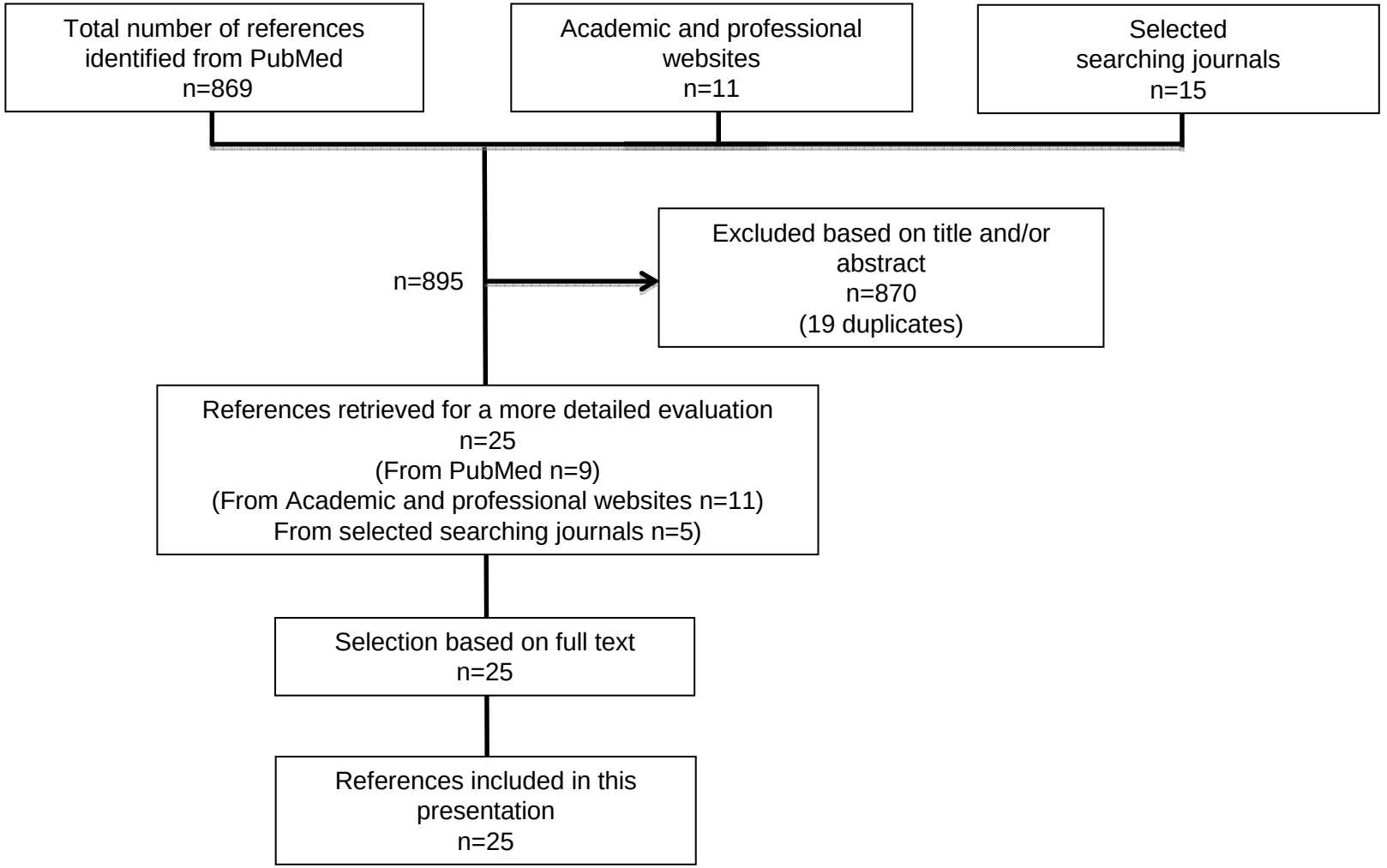
Aims

- To get a global overview about the effective role of radiographer in the performance of radiological procedures
- To understand the competences hold by radiographers in radiation protection
- To reflect about the need of education, training and CPD to ensure a safer radiological practice

Methods

- A literature search was performed in PubMed, in selected searching journals and in academic and professional websites
- A search was undertaken using a Boolean strategy combining key-words such as
  - “radiographers”
  - “radiological technologists”
  - “radiation protection”
  - “education”
  - “training”
  - “continuing professional development”

Methods


Total number of references identified from PubMed n=869
Academic and professional websites n=11
Selected searching journals n=15
n=895
Excluded based on title and/or abstract n=870 (19 duplicates)
References retrieved for a more detailed evaluation n=25 (From PubMed n=9) (From Academic and professional websites n=11) From selected searching journals n=5)
Selection based on full text n=25
References included in this presentation n=25

Results & Discussion
Who is the Radiographer?

- A definition of the radiographer profession is provided by EFRS

  - Radiographers are medical imaging and radiotherapy experts who are professionally accountable to the patients' physical and psychosocial well being, prior to, during and following examinations or therapy

  - Radiographers take an active role in justification and optimisation of medical imaging and radio therapeutic procedures and are key-persons in radiation safety of patients and third persons in accordance with ALARA principle and relevant legislation

EFRS. Definition of a radiographer and list of national titles in Europe. EFRS General Assembly. 2011;(November).

Results & Discussion
Who is the Radiographer?

- While using a wide range of sophisticated equipment and techniques in several radiological procedures, radiographers are directly responsible for the radiation delivered to the patient

- In the diagnostic field, the radiographer profession involves the competence to be able to perform a full range of plain film and standard contrast agent examinations
  - e.g. general radiography, mammography, angiography, computed tomography (CT), positron emission tomography, fluoroscopic and interventional procedures

- In the therapy field the radiographer is able to perform the full range of radiotherapy processes and techniques (e.g. linear accelerator) accurately and safely aiming the patient treatment

HPC. Standards of Proficiency - Radiographers [Internet]. 2009. Available from: http://www.hpc-uk.org/

Results & Discussion

What competences related with radiation safety?

- Performing a wide range of radiological procedures involves a mandatory knowledge about radiation protection and safety
- Competences include the optimization of radiation exposure for patients (contributing to the establishment of DRLs), staff and carers
- The need to understand and safely use radiation is mandatory while the knowledge of the radiographer should be used to advise other healthcare professionals regarding safe practice
- The radiographer owns the competence to critical appraise to the use of ionising radiation

Results & Discussion

What competences related with radiation safety?

- A key factor in applying radiation protection competences in clinical practice is to ensure that use of X-ray techniques and equipment is optimized
- Radiographers who operate the X-ray equipment and medical physicists both have key roles to play
- Radiographers should optimise techniques to minimise the dose to the patient, and the medical physics service should supervise performance tests of equipment and surveys of patient doses to inform and facilitate the optimisation process (Martin, 2011)

Martin CJ. Management of patient dose in radiology in the UK. Radiation protection dosimetry [Internet]. 2011 Nov [cited 2012 Mar 26];147(3):355–72. Available from: http://www.ncbi.nlm.nih.gov/pubmed/22008582

Reminding the 3rd question…

- What education, training and CPD is needed to ensure a safer radiological practice?

Results & Discussion

- The need of education, training and CPD to ensure a safer radiological practice is thus a major topic of concern
- Radiographers need to understand how the different technical options affect dose and the results of their actions
- The increasing use of ionizing radiation for medical purposes all over the World, due to the wide spectrum of available radiological equipment and techniques, requires that radiographers are up-to-dated in terms of knowledge and competence level

Results & Discussion
Radiographer education

- Refers to the undergraduate education, including knowledge, understanding and clinical practice about subjects such as guidance principles of radiation protection, radiation quantities and units, and radiation protection factors affecting patient and staff doses

- It also includes postgraduate education of radiographers - at a higher education level - on radiation protection topics

Results & Discussion
The educational background

- Worldwide, radiography educational programmes should be based, where possible, in Universities or institutions of higher education in cooperation with medical imaging or oncology departments, as appropriate

ISRRT. Guidelines for the Education Of Entry-level Professional Practice In Medical Radiation Sciences [Internet]. The International Society of Radiographers and Radiological Technologists. 2004 [cited 2012 Apr 2]; Available from: http://www.isrrt.org/isrrt/Education_Standards.asp?SnID=1811889212

Results & Discussion
The educational background

- In Europe, first cycle programs varies between three (e.g., United Kingdom, Norway, Italy) and 4 years (e.g., Netherlands, Ireland, Malta, Portugal)

- In Japan radiography undergraduate programmes are all university-based 4 year courses

- ASRT recognizes the baccalaureate degree in radiography as the professional level of radiologic science education. Programmes are currently ranging from straight four-year programs to 2+2 and 1+2+1 programs

Akimoto T, Caruana CJ, Shimosegawa M. A qualitative comparative survey of First Cycle radiography programmes in Europe and Japan. Radiography [Internet]. 2009 Nov [cited 2012 Apr 10];15(4):333–40. Available from: http://linkinghub.elsevier.com/retrieve/pii/S1078817409000327

ASRT. Bachelor of Science in Radiologic Sciences (B.S.R.S.) Core Curriculum [Internet]. American Society of Radiologic Technologists. 2012 [cited 2012 Apr 17]; Available from: https://www.asrt.org/content/Educators/Curricula/BSRS/bsrs.aspx

Results & Discussion
The educational background

- The required education background to achieve the competence to work in the field should require a first cycle education at bachelor level (3 to 4 years)
- This is the required qualification to enable radiographers to practice in the fields of
  - diagnostic radiography
  - nuclear medicine
  - therapeutic radiography
- Typical degrees offered are bachelor in Radiography, Nuclear Medicine and Radiotherapy, or combinations of the above

HENRE. Overview of the Tuning Template for Radiography in Europe [Internet]. Lancaster: 2008.
Available from: http://www.unideusto.org/tuningeu/images/stories/template/Radiography_overview.pdf

Results & Discussion

The educational background: First Cycle competences related with radiation safety

- Practise the profession in accordance with current internationally approved statutes and regulations concerning the medical use of ionizing radiation
- Optimally reduce and calculate effective radiation doses for patients, staff and carers
- Understand and use radiation protection protocols. Advise other professionals regarding safe practice in this area
- Set dose reference levels for all examinations and keep them optimised and updated
- Critical approach to the use of ionising radiation

HENRE. Overview of the Tuning Template for Radiography in Europe [Internet]. Lancaster: 2008.
Available from: http://www.unideusto.org/tuningeu/images/stories/template/Radiography_overview.pdf

Results & Discussion
The educational background

- At a second cycle or Masters level, two different groups of qualifications are available
  - in the clinically focused areas
  - in the non-clinically focused areas
- The research doctorate is related to the creation and expansion of knowledge within the professional field

HENRE. Overview of the Tuning Template for Radiography in Europe [Internet]. Lancaster: 2008.
Available from: http://www.unideusto.org/tuningeu/images/stories/template/Radiography_overview.pdf

Results & Discussion
Radiographer training

- Refers to training and practice related to the ionizing radiation modalities used by the radiographer in clinical practice

- Includes the required specialized knowledge for optimization of the radiation protection process and should involve a significant development of practical skills

Results & Discussion
Training – digital radiology

- The transition from conventional screen-film radiology to digital radiology requires formal education, continuing education and training (Nyathi, 2010)

- Staff training is essential on these newer systems, e.g. to reduce manufacturers recommended range Exposure Index and optimize patient dose (Warren-Forward, 2007)

Nyathi, T., Chirwa, T., & van der Merwe, D. (2010). A survey of digital radiography practice in four South African teaching hospitals: an illuminative study. *Biomedical imaging and intervention journal*, *6*(1), e5. doi:10.2349/biij.6.1.e5

Warren-Forward, H., Arthur, L., Hobson, L., Skinner, R., Watts, a, Clapham, K., Lou, D., et al. (2007). An assessment of exposure indices in computed radiography for the posterior-anterior chest and the lateral lumbar spine.*The British journal of radiology*, *80*(949), 26-31.

Results & Discussion
Training – digital radiology & pediatrics

- There is a clear and widespread need for comprehensive education in digital image technology at a practical level for radiologic technologists (Morrison, 2011)
- Improved methods of communication among radiologists, technologists, radiology managers, physicists and equipment specialists are needed to create change in the digital imaging environment that allows better digital radiographic images with less radiation exposure to pediatric patients
- The creation of better DR educational materials, training programs, and continuing educational opportunities will require broad commitment from equipment manufacturers and vendors, educational institutions, pediatric radiology specialty societies and organizations, and individual imaging specialists

Morrison, G., John, S. D., Goske, M. J., Charkot, E., Herrmann, T., Smith, S. N., Culbertson, J., et al. (2011). Pediatric digital radiography education for radiologic technologists: current state. *Pediatric radiology*, *41*(5), 602-10. doi:10.1007/s00247-010-1904-3

Results & Discussion
Training – digital radiology & pediatrics

- For radiologists and radiologic technologists who use DR, there is a state of confusion. Radiologists might not like low-exposure noisy images, and this might result in technologists increasing exposures, which results in patients receiving excessive doses (Don, 2011)

- The implementation of measures to promote the production of optimal images while minimizing radiation exposure requires cooperation and communication among imaging professionals, manufacturers and regulatory agencies (Goske, 2011)

Don, S. (2011). Pediatric digital radiography summit overview: state of confusion. *Pediatric radiology*, *41*(5), 567-72. doi:10.1007/s00247-010-1905-

Goske, M. J., Charkot, E., Herrmann, T., John, S. D., Mills, T. T., Morrison, G., & Smith, S. N. (2011). Image Gently: challenges for radiologic technologists when performing digital radiography in children. *Pediatric radiology*, *41*(5), 611-9. doi:10.1007/s00247-010-1957-3

Results & Discussion
Training – CT

- Training is needed!
- Patient safety must be improved!

- Examples (Antyphas, 2011)
  - Avoiding unnecessary CT examinations
  - Adjusting individual scanning parameters
  - Revising protocols
  - Use of shielding and dose monitoring
  - Implementing computer-based dose modulation software
  - Educating referring physicians and radiologic technologists

Antypas, E. J., Sokhandon, F., Farah, M., Emerson, S., Bis, K. G., Tien, H., & Mezwa, D. (2011). A Comprehensive Approach to CT Radiation Dose Reduction: One Institution's Experience. *American Journal of Roentgenology*, *197*(4), 935-940. doi:10.2214/AJR.11.6460

Results & Discussion
Training

- Radiologic technologists are aware of exposure increases and may be contributing to the increase in patient dose in the U.S., largely because there is a lack of in-service education
- Commonly recognized and accepted methods of radiation protection practices are being applied to reduce dose to U.S. patients, but not routinely
- These skills require periodic updates and reminders (Johnston, 2011)

Johnston, J., Killion, J. B., Vealé, B., & Comello, R. (2011). U.S. Technologists' Radiation Exposure Perceptions and Practices. *Radiologic Technology*, *82*(4), 311-320.

Results & Discussion
Training

- There is a need for educational and organizational interventions to increase compliance with safety practices for patients and personnel (Reagan, 2010; Slechta, 2008)

Reagan, J. T., & Slechta, A. M. (2010). Factors Related to Radiation Safety Practices in California. *Radiologic Technology*, *81*(6), 538-547.

Slechta, A. M., & Reagan, J. T. (2008). An Examination of Factors Related To Radiation Protection Practices. *Radiologic Technology*, *79*(4), 297-306.

Results & Discussion
Radiographer CPD

- Continuing professional development (CPD) refers to a continuing process, outside formal undergraduate and/or postgraduate education, empowering the radiographer to maintain and improve standards of radiography practice through the development of knowledge, skills, attitudes and behavior related to radiation protection

Results & Discussion
CPD

- Radiographers are motivated to engage in CPD activities. Formal and structured CPD activities were preferred to informal CPD activities (Lee, 2010)

- Decreased participation rates in CPD are mainly due to time constraints and workloads. Participation in CPD programmes is likely to be increased with more in-house education and workplace seminars. Changes need to be made to the current CPD programme to improve its accessibility and usability (Sholer, 2011)

Lee, S., Reed, W., & Poulos A. (2010) Continuing Professional Development: the perceptions of radiographers in New South Wales. *The Radiographer*, 57 (1): 33–39.

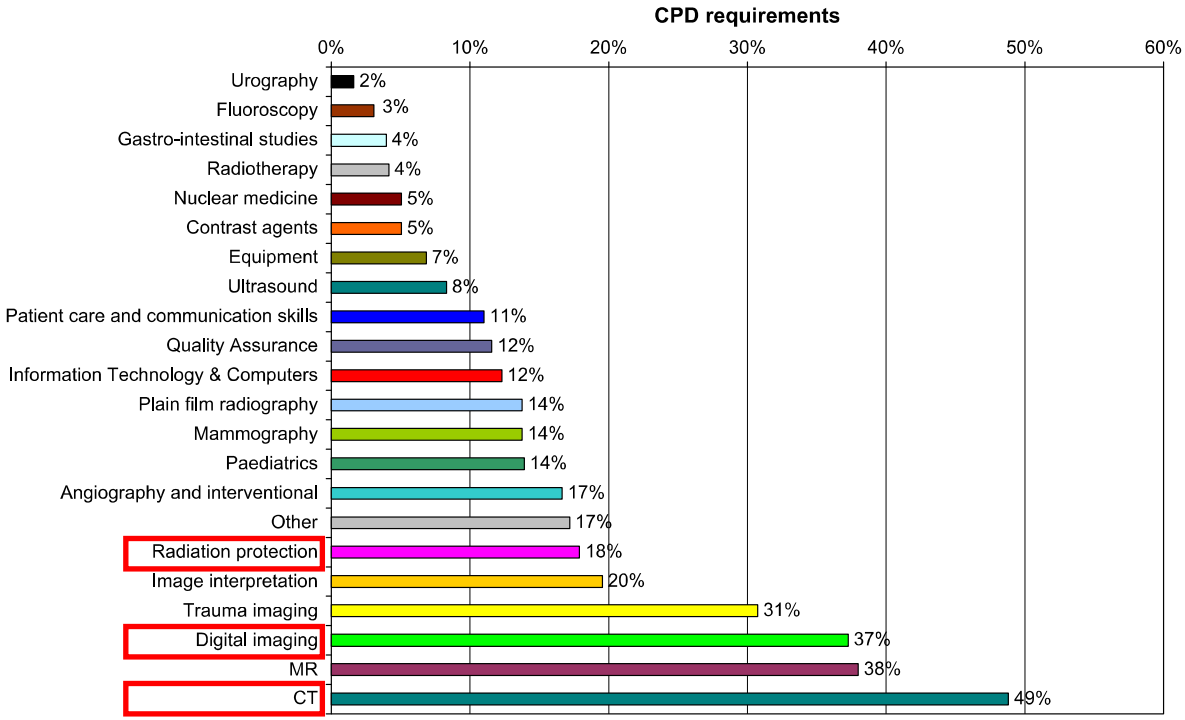
Sholer, H., Tonkin, S., Lau, K.F., Law, C., Rahman, R., & Halkett, G.K.B. (2011) Continuing professional development: Western Australian radiographers' opinions and attitudes. *The Radiographer*, 58 (2): 19–24.

Results & Discussion
CPD

- The importance of CPD and the mutual areas of educational interest related to advancing practice support the possibilities for further work on Europe wide CPD provision of self-directed CPD by radiographic practitioners (Marshall, 2008)

Marshall, G., Punys, V., Sykes, A. (2008) The continuous professional development (CPD) requirements of radiographers in Europe: An initial survey. *Radiography*, 14, 332-342.

Results & Discussion
CPD



n=734

(Marshall, 2008)

- 12 European countries have participated:
  - Cyprus
  - Estonia
  - Finland
  - France
  - Germany
  - Greece
  - Lithuania
  - Malta
  - Netherlands
  - Norway
  - Sweden
  - UK

Marshall, G., Punys, V., Sykes, A. (2008) The continuous professional development (CPD) requirements of radiographers in Europe: An initial survey. *Radiography*, 14, 332-342.

Conclusions

- Radiographers are highly qualified professionals that play an effective role in radiation protection
- While members of a healthcare team their accountability should be acknowledged
- Their direct actions within their field of competence and expertise influence the radiation dose received by the patients, staff or carers
- Radiographer education, training and CPD in radiation protection are mandatory issues to a safer radiological practice

MEDRAPET

Medical Radiation Protection
EDUCATION AND TRAINING

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